

Advanced Lithium Sulfur Battery, Phase II

Completed Technology Project (2017 - 2021)



Project Introduction

CRG proposes to develop an Advanced Lithium Sulfur Battery (LSB) based on combining a novel super ion conducting ceramic electrolyte, entrapped sulfur cathode, and a lithium metal anode necessary to meet NASA's needs for high energy density, rechargeable, and safe energy storage. These new materials for LSBs will build upon a proven ceramic electrolyte for rechargeable lithium metal batteries. A composition of a metallic lithium anode, ceramic electrolyte, and a novel sulfur cathode will be optimized to achieve program goals for energy density, operational temperatures, storage, and cycle life. Supporting the Human Exploration and Operations Directorate, this project's technologies directly address requirements for high energy density space batteries for space exploration systems including rovers, landers, ascent vehicle space craft. This project's technologies offer high energy density (>450 Whr/kg), long storage life, and long operational life batteries. These advancements will enable space power supplies to keep pace with increasing electricity demands, and reduce battery weight by 50% while advancing the state of the art battery technology.

Anticipated Benefits

Supporting the Human Exploration and Operations Directorate, this project's technologies directly address requirements for high energy density space batteries for space exploration systems including rovers, landers, ascent vehicle space craft. This project's technologies offer high energy density (>450 Whr/kg), long storage life, and long operational life batteries. These advancements will enable space power supplies to keep pace with increasing electricity demands, and reduce battery weight by 50% while advancing the state of the art battery technology. This project's technologies, developed for NASA systems, would directly apply to systems operated by other government and commercial enterprises. Advanced battery chemistries have been gaining interest for electric vehicles, UAVs, portable devices, and multifunctional structural materials. The technology is also generally applicable for a variety of other energy storage applications of interest to the DoE. Lithium metal battery systems enable significantly higher energy density at safe operating conditions that would be considered revolutionary for a variety of applications.



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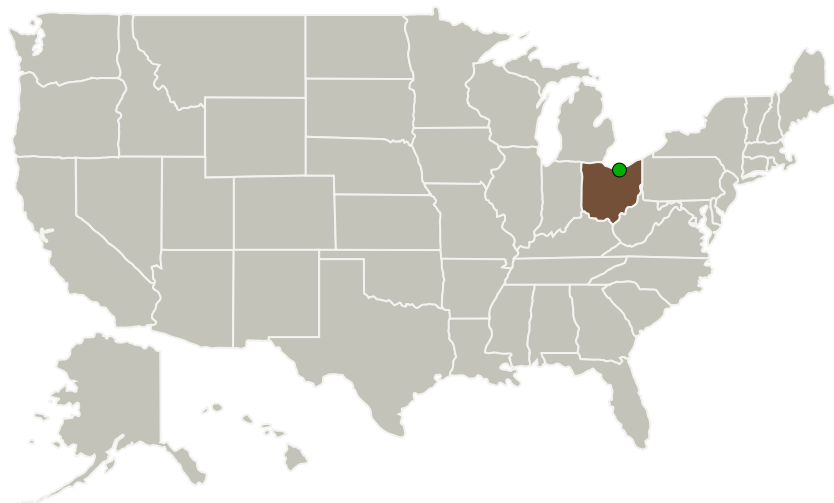
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Primary U.S. Work Locations and Key Partners




Organizations Performing Work	Role	Type	Location
Cornerstone Research Group, Inc.	Lead Organization	Industry	Miamisburg, Ohio
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

Ohio

Project Transitions

 **April 2017:** Project Start **November 2020:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140945>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Cornerstone Research Group, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Managers:Matthew C Deans
Patricia L Loyselle**Principal Investigator:**

Brian E Henslee

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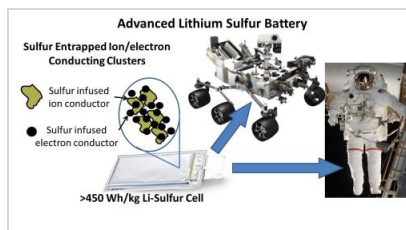


December 2021: Closed out

Closeout Documentation:

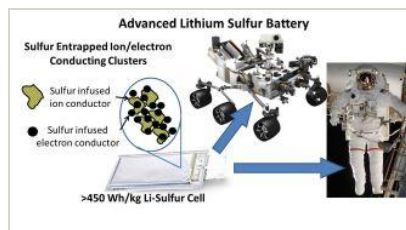
- Final Summary Chart PDF(<https://techport.nasa.gov/file/140946>)

Images



Briefing Chart Image

Advanced Lithium Sulfur Battery,
Phase II Briefing Chart Image
(<https://techport.nasa.gov/image/130501>)

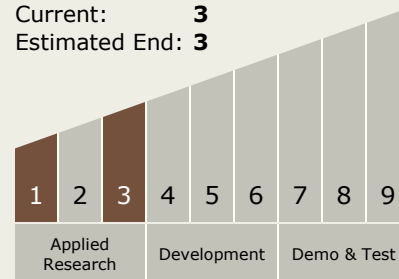


Final Summary Chart Image

Advanced Lithium Sulfur Battery,
Phase II
(<https://techport.nasa.gov/image/131607>)

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System